Citation:

Lee SA, Shu XO, Yang G, Li H, Gao YT, Zheng W. Animal origin foods and colorectal cancer risk: A report from the Shanghai Women's Health Study. *Nutr Cancer.* 2009; 61(2): 194-205.

PubMed ID: 19235035

Study Design:

Prospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To describe the association of animal-origin food consumption and cooking methods with colorectal cancer.

Inclusion Criteria:

Participant of the Shanghai Women's Health Study, which began in March 1997 and included women living in urban communities of Shanghai, China who were 40 to 70 years of age at recruitment.

Exclusion Criteria:

- Women with a history of cancer at baseline
- Women with extreme total energy intake (less than 500 or 3,500kcal or more per day)
- Women lacking detailed information on cancer
- Women who were lost to follow-up shortly after recruitment.

Description of Study Protocol:

Recruitment

A total of 74,942 (of 81,170 eligible) women who were 40 to 70 years of age were recruited from seven urban communities in Shanghai, China for the Shanghai Women's Health Study, which was initiated in March 1997.

Design

Prospective cohort study.

Dietary Intake/Dietary Assessment Methodology

A validated, quantitative food-frequency questionnaire (FFQ) was administered by in-person interviews. Participants were asked how often, on average, during the past year she had consumed a specific food or food group and was also asked about the cooking methods used.

Statistical Analysis

- Person-years of follow-up were calculated from the date of the baseline interview to the date of cancer diagnosis, death or date of last follow-up (December 31, 2005), whichever came first
- Analyses were based on dietary information collected in the baseline interview and also using the cumulative average diet reported on the baseline and first follow-up questionnaire for women who did not report cancer, diabetes or myocardial infarction (MI) during this time
- Study participants were classified into five categories according to quintile distributions of the whole cohort for all types of animal-origin foods and fat intake
- Relative risks associated with animal-origin food intake and cooking methods were estimated using Cox proportional hazards regression modeling
- Tests of linear trend were estimated by modeling each animal-origin food and fat or cholesterol intake as continuous variables.

Data Collection Summary:

Timing of Measurements

- FFQ were administered at baseline and two to three years later
- Every two years, participants were interviewed to record details of their interim health history.

Dependent Variables

Colorectal cancer: Cases were identified by in-person follow-up surveys, annual record linkage with the Shanghai Cancer Registry and death certificate registry. Cases were verified through home visits, medical charts and pathological evidence.

Independent Variables

Frequency of consumption of specific meats, fats and use of certain cooking methods:

- Total meat intake (quintiles) and specific types
- Total fat intake (quintiles) and specific types
- Method of cooking meats (deep-frying, stir frying, roasting, smoking, salting).

Control Variables

- Age
- Education
- Income
- Season of recruitment
- Tea consumption
- Nonsteroidal anti-inflammatory drug use
- Total energy intake
- Fiber intake.

Description of Actual Data Sample:

- *Initial N:* 74,942 participants
- *Attrition (final N):* 73,224 (after applying exclusion criteria)
- *Age:* 40 to 70 years at baseline
- *Ethnicity:* Resident of Shanghai, China
- *Other relevant demographics:* From urban communities
- *Location:* Shanghai, China.

Summary of Results:

Key Findings

- After a mean follow-up of 7.4 years, 394 incident cases of colorectal (236 colon, 158 rectal) cancer were observed
- Total meat intake was not associated with risk of colorectal cancer (P=0.30), nor was red meat (P=0.53) poultry intake (P=0.23) or egg intake (P=0.57)
- Milk intake was inversely associated with the risk of colon cancer (P=0.05), but not for colorectal cancer
- Neither marine nor fresh water fish intake was related to colorectal cancer risk, but eel (P=0.01), shrimp (P=0.06) and shellfish (P=0.04) were significantly associated with an increased risk of colorectal cancer
- Neither total fat intake nor subtypes of fat intake were associated with the risk of colorectal cancer
- Smoking was the only cooking method associated with the risk of colon cancer (RR=1.4 for ever vs. never, 95% CI: 1.1 to 1.9)
- Women in the highest quintile of egg intake had a higher risk of colorectal cancer compared to women in the lowest quintile.

Relative Risk (95% CI) of Colorectal Cancer in Relation to Animal Food Intake and Fat Intake (g per day)

Variables	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
Total meat intake[a,b]	Reference	0.9	0.8	1.1	0.9 (0.7 to 1.4)
Total fat intake[a,c]	Reference	1.0	0.9	0.7	1.1 (0.7 to 1.7)
Egg intake[d]	Reference	1.3	1.3	1.0	1.4 (1.1 to 2.0)
Milk intake[e]	Reference	0.8	0.9	0.7	0.8 (0.5 to 1.2)

[a] Adjusted for age, education, income, survey season, tea consumption, nonsteroidal anti-inflammatory drug use, energy intake and fiber intake.

[b] P for trend = 0.30.

[c] P for trend = 0.82.

[d] P for trend = 0.57.

[e] P for trend = 0.09.

Author Conclusion:

There was no evidence of an association between meat or fat consumption, including any of their subtypes, and colorectal cancer incidence among Chinese women in Shanghai.

Reviewer Comments:

Study Strengths

- *Dietary information was collected by in-person interview using a validated questionnaire*
- *Selection bias was minimized with the high participation rates for both baseline recruitment and cohort follow-ups*
- *The two FFQs, administered two to three years apart, improved the dietary assessment*
- *Information on many lifestyle factors was collected to allow adjustment for potential confounders.*

Study Limitations

- *Short follow-up time (mean of 7.4 years)*
- *Some finding may be due to chance as a result of multiple comparisons and the relatively low amount of consumption of eel, shellfish and shrimp.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions		
1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	N/A
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	N/A

Validity Questions		
1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes

1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	N/A
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	N/A
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A

5.	**Was blinding used to prevent introduction of bias?**	???
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	???
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	???
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	???
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes

7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	N/A
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	N/A
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes